IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No.: **004438.0005**

In re Application of:	§	
	§	
KLIMASAUSAKAS ET AL.	§	Examiner: **JONES, H.**
	§	
Serial No. **09/165,854**	§	Art Unit: **2763**
	§	
Filed: **2 OCTOBER 1998**	§	
	§	
For: **HYBRID LINEAR NEURAL NETWORK PROCESS CONTROL**	§	

PRELIMINARLY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

This Preliminarly Amendment is submitted in response to the Examiner's Final Office Action dated September 27, 2000, having a shortened statutory period set to expire December 27, 2001.

CERTIFICATE OF MAILING
37 CFR 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as First-Class Mail in an envelope addressed to: Assistant Commissioner of Patents, Washington, D. C. 20231 on the date below.

3/27/01
Date

Signature April Binder

IN THE CLAIMS

Please amend the claims as follows:

1. (Amended) An apparatus for modelling a process, said process includes one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables process output conditions, said apparatus comprising:

a primary analyzer for generating a set of outputs using a first set of disturbance variables, manipulated variables, and controlled variables as inputs to a curve-fitting algorithm;

an error correction analyzer, coupled to said primary analyzer, for generating a set of error correction variables using said set of outputs from said primary analyzer and a second set of disturbance variables, manipulated variables, and controlled variables as inputs; and

an adder, coupled to said primary analyzer and said error correction analyzer, for generating a set of control variables for modelling said process by summing said set of outputs from said primary analyzer and said set of error correction variables from said error correction analyzer.

2. (Amended) The apparatus of Claim 1, wherein said primary analyzer samples said first set of disturbance variables, manipulated variables, and controlled variables continuously.

3. (Amended) The apparatus of Claim 1, wherein said primary analyzer samples said first set of disturbance variables, manipulated variables, and controlled variables in predetermined delay periods.

4. (Amended) The apparatus of Claim 3, wherein said predetermined delay periods are determined by an adaptive process.

5. (Amended) The apparatus of Claim 3, wherein said predetermined delay periods are user selectable.

Please cancel Claim 6.

7. (Amended) The apparatus of Claim 1, wherein said disturbance variables and said manipulated variables are latent variables.

8. (Amended) The apparatus of Claim 1, wherein said curve-fitting algorithm is based on a linear model.

9. (unchanged) The apparatus of Claim 8, wherein said linear model is a Partial Least Squares (PLS) model.

10. (Amended) The apparatus of Claim 9, wherein said apparatus further includes a filter coupled to said primary analyzer for providing a filtered vector as an output.

11. (unchanged) The apparatus of claim 10, wherein said filter is adaptive.

12. (unchanged) The apparatus of claim 10, wherein said filter is a Kalman filter adapted to receive said controlled variables.

Please cancel Claim 13.

14. (unchanged) The apparatus of claim 9, wherein said error correction analyzer is a neural network.

Please cancel Claim 15.

16. (Amended) The apparatus of claim 14, wherein said apparatus further includes a filter coupled to an input of said primary analyzer.

17. (Amended) The apparatus of claim 9, wherein said error correction analyzer is based on a neural network partial least squares model.

18. (Amended) The apparatus of claim 1, wherein said apparatus further includes:

a distributed control system coupled to the output of said adder; and

a run-time delay and variable selector coupled to the output of said distributed control system.

19. (Amended) The apparatus of claim 18, wherein said run-time delay and variable selector are adapted to receive delay and variable settings, wherein said primary analyzer and said error correction analyzer are adapted to receive model parameters, said apparatus further includes:

a data repository for storing historical values of said disturbance variables, said manipulated variables and said controlled variables;

a development delay and variable selector coupled to said data repository for selecting and time-shifting one or more of said disturbance variables, said manipulated variables and said controlled variables, said development delay and variable selector generating said delay and variable settings; and

a hybrid development analyzer coupled to said development delay and variable selector, said hybrid development analyzer generating said model parameters.

20. (unchanged) The apparatus of claim 18, wherein said hybrid development analyzer further comprises:

a development primary analyzer coupled to said data repository, said development primary analyzer adapted to sample a development input vector spanning one or more of said disturbance variables and manipulated variables, said development primary analyzer adapted to sample one or more controlled variables, said development primary analyzer generating an output based on said input vector;

a subtractor coupled to said data repository and to said development primary analyzer, said subtractor adapted to receive one or more controlled variables from said data repository, said subtractor generating a primary model error output;

a development error correction analyzer coupled to said data repository and said development primary analyzer error output, said development error correction analyzer adapted to sample said development input vector, said development error correction analyzer estimating a residual between said development primary analyzer output and said controlled variables; and

an adder coupled to the output of said development primary analyzer and said development error correction analyzer, said adder summing the output of said primary and error correction analyzers to estimate said controlled variables.

Please cancel Claims 21-39.

Please add Claim 40.

40. (New) A program storage device having a computer readable program code embodied therein for modelling a process, said process includes one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control

conditions, and one or more corresponding controlled variables process output conditions, said program storage device comprising:

program code means for generating a set of outputs using a first set of disturbance variables, manipulated variables, and controlled variables as inputs to a curve-fitting algorithm;

program code means for generating a set of error correction variables using said set of outputs from said primary analyzer and a second set of disturbance variables, manipulated variables, and controlled variables as inputs; and

program code means for generating a set of control variables for modelling said process by summing said set of outputs from said primary analyzer and said set of error correction variables from said error correction analyzer.

REMARKS

Applicants have amended the claims to further characterize the claimed invention over the cited prior art.

No extension of time or fee is believed to be necessary because a three-month extension of time had been requested and a $890.00 check for the extension of time had been submitted along with the previous amendment. However, in the event that any extension of time or fee is required for the prosecution of this application, please charge it against the firm Deposit Account No. **50-0259**.

Respectfully submitted,

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ATTORNEY FOR APPLICANTS

1. (Amended) An apparatus for modelling a process, said process [having] includes one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables process output conditions, said apparatus comprising:

a [data derived] primary analyzer [adapted to sample an input vector spanning one or more of said] for generating a set of outputs using a first set of disturbance variables, [and] manipulated variables, and controlled variables as inputs to a curve-fitting algorithm [said data derived primary analyzer generating an output based on said input vector];

an error correction analyzer, coupled to said primary analyzer, for generating a set of error correction variables using said set of outputs from said primary analyzer and a second set of disturbance variables, manipulated variables, and controlled variables as inputs [adapted to sample said input vector, said error correction analyzer estimating a residual between said data derived primary analyzer output and said controlled variables]; and

an adder, coupled to [the output of] said [data derived] primary analyzer and said error correction analyzer, for generating a set of control variables for modelling said process by summing said set of outputs from said primary analyzer and said set of error correction variables from said error correction analyzer [said adder summing the output of said primary and error correction analyzers to estimate said controlled variables].

2. (Amended) The apparatus of Claim 1, wherein said [data derived] primary analyzer [and said error correction analyzer] samples said [input vector] first set of disturbance variables, manipulated variables, and controlled variables continuously.

3. (Amended) The apparatus of Claim 1, wherein said [data derived] primary analyzer [and said error correction analyzer] samples said [input vector] first set of disturbance variables, manipulated variables, and controlled variables in [using] predetermined delay periods.

4. (Amended) The apparatus of Claim 3, wherein said predetermined delay periods [is] are determined by an adaptive process.

5. (Amended) The apparatus of Claim 3, wherein said predetermined delay periods [is] are user selectable.

6. cancelled.

7. (Amended) The apparatus of Claim 1, wherein said disturbance variables and said manipulated variables are latent variables.

8. (Amended) The apparatus of Claim 1, wherein said [data derived primary analyzer] curve-fitting algorithm is based on a linear model.

9. (unchanged) The apparatus of Claim 8, wherein said linear model is a Partial Least Squares (PLS) model.

10. (Amended) The apparatus of claim 9, wherein said apparatus further includes [comprising] a filter coupled to [the output of] said [data derived] primary analyzer[, said filter receiving said output vector and] for providing a filtered vector as an output.

11. (unchanged) The apparatus of claim 10, wherein said filter is adaptive.

12. (unchanged) The apparatus of claim 10, wherein said filter is a Kalman filter adapted to receive said controlled variables.

13. cancelled.

14. (unchanged) The apparatus of claim 9, wherein said error correction analyzer is a neural network.

15. cancelled.

16. (Amended) The apparatus of claim 14, wherein said apparatus further includes [comprising] a filter coupled to [the] an input of said [data derived] primary analyzer[, said filter receiving said input vector and providing a filtered vector for capturing the dynamics of the process to the input of said neural network].

17. (Amended) The apparatus of claim 9, wherein said error correction analyzer is based on a neural network partial least squares model.

18. (Amended) The apparatus of claim 1, wherein said apparatus further includes [comprising]:

a distributed control system coupled to the output of said adder; and

a run-time delay and variable selector coupled to the output of said distributed control system[, said run-time delay and variable selector generating said input vector].

19. (Amended) The apparatus of claim 18, wherein said run-time delay and variable selector are adapted to receive delay and variable settings, wherein said [data derived] primary analyzer and said error correction analyzer are adapted to receive model parameters, said apparatus further includes [comprising]:

a data repository for storing historical values of said disturbance variables, said manipulated variables and said controlled variables;

a development delay and variable selector coupled to said data repository for

selecting and time-shifting one or more of said disturbance variables, said manipulated variables and said controlled variables, said development delay and variable selector generating said delay and variable settings; and

a hybrid development analyzer coupled to said development delay and variable selector, said hybrid development analyzer generating said model parameters.

20. (unchanged) The apparatus of claim 18, wherein said hybrid development analyzer further comprises:

a development primary analyzer coupled to said data repository, said development primary analyzer adapted to sample a development input vector spanning one or more of said disturbance variables and manipulated variables, said development primary analyzer adapted to sample one or more controlled variables, said development primary analyzer generating an output based on said input vector;

a subtractor coupled to said data repository and to said development primary analyzer, said subtractor adapted to receive one or more controlled variables from said data repository, said subtractor generating a primary model error output;

a development error correction analyzer coupled to said data repository and said development primary analyzer error output, said development error correction analyzer adapted to sample said development input vector, said development error correction analyzer estimating a residual between said development primary analyzer output and said controlled variables; and

an adder coupled to the output of said development primary analyzer and said development error correction analyzer, said adder summing the output of said primary and error correction analyzers to estimate said controlled variables.

21-39. cancelled

40. (New) A program storage device having a computer readable program code embodied therein for modelling a process, said process includes one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables process output conditions, said program storage device comprising:

program code means for generating a set of outputs using a first set of disturbance variables, manipulated variables, and controlled variables as inputs to a curve-fitting algorithm;

program code means for generating a set of error correction variables using said set of outputs from said primary analyzer and a second set of disturbance variables,

manipulated variables, and controlled variables as inputs; and

program code means for generating a set of control variables for modelling said process by summing said set of outputs from said primary analyzer and said set of error correction variables from said error correction analyzer.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Applicants: CASIMIR C. KLIMASAUSKAS & JOHN P. GUIVER	§	Art Unit:	Unknown
Filed:	§	Examiner:	Unknown
Serial No.	§		
For: HYBRID LINEAR-NEURAL NETWORK PROCESS CONTROL	§	Docket No.	C98054US

PRELIMINARY AMENDMENT

Commissioner of Patents
Washington, D.C. 20231

Dear Sir:

Before consideration of this case, please amend the claims as follows:

In the Claims:

Please cancel claims 6 and 13.

Please add new claims 40-42:

40. (NEW) An apparatus for modeling a process, said process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said apparatus comprising:

a data derived empirical primary analyzer adapted to sample an input vector spanning one or more of said disturbance variables and manipulated variables, said data derived empirical primary analyzer generating an output based on said input vector;

an error correction analyzer adapted to sample said input vector, said error correction analyzer estimating a residual between said data derived empirical primary empirical analyzer output and said controlled variables; and

an adder coupled to the output of said data derived empirical primary analyzer and said error correction analyzer, said adder summing the output of said primary and error correction analyzers to estimate said controlled variables.

41. (NEW) A method for modeling a process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said method comprising the steps of:

(a) picking one or more selected variables from said disturbance variables and said manipulated variables;

(b) providing said selected variables to a data derived empirical primary analyzer and an error correction analyzer;

(c) generating a primary output from said selected variables using said data derived empirical primary analyzer;

(d) generating a predicted error output from said selected variables using said error correction analyzer; and

(e) summing the output of said primary and error correction analyzers.

42. (NEW) A program storage device having a computer readable program code embodied therein for modeling a process, said process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said program storage device comprising:

a data derived empirical primary analyzing code adapted to sample an input vector spanning one or more of said disturbance variables and manipulated variables, said data derived empirical primary analyzing code generating an output based on said input vector;

an error correction analyzing code adapted to sample said input vector, said error correction analyzing code estimating a residual between said data derived empirical primary analyzing code output and said controlled variables; and

an adder code coupled to the output of said data derived empirical primary analyzing code and said error correction analyzing code, said adder code summing the output of said primary and error correction analyzing code to estimate said controlled variables.

REMARKS

This is a continuation application of a case to be allowed providing new claims. Applicants submit claims 1-5, 7-12, 14-39, and new claims 40-42 to be allowed. If there are any questions or comments, please contact Albert B. Kimball, Jr. at (713) 850-0909.

Respectfully submitted,

Albert B. Kimball, Jr., Reg. No. 25,689

Date: October 2, 1998

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231 on October 2, 1998.

Albert B. Kimball, Jr., Reg. No. 25,689